

# COMPUTING INFRASTRUCTURES QUESTIONS

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## Multiple choices

**A cloud in which a company holds its own cloud infrastructure, but can rent virtual machines when needed is a**

Hybrid Cloud

**A cloud in which a company holds its own cloud infrastructure, but can use virtual machines from other fellow private clouds with which some partnership relations exist is a**

Community Cloud

**A process VM**

Provides the interface to system calls and user ISA

**A program running at the Application Binary Interface (ABI) level**

Directly use the user instructions of a CPU, but call O.S. procedures to access the hardware resources

**A System Virtual Machine can provide its functionality**

Either working directly on the hardware or running on an Operating System

**A System VM**

Provides the interface to system ISA and user ISA

**A Virtual Machine**

may appear as having different resources than the physical machine

may result in a different level of performance with respect to the physical machine

provides identical software behaviour

**An emulator**

Reproduces the machine by providing not only ABI but ISA (user/system)

**An end-user of a cloud application (i.e. a Customer Relation Management application) typically**

Uses a SaaS developed with a PaaS and running on an IaaS

**Consider an array of N disks. Select the right order of the RAID levels in terms of  $MTTF_{RAID}$  in descending order, i.e. for the higher to the lower MTTF. Consider a number of disks N that is large enough to satisfy the minimum requirements for all the RAID levels.**

RAID 1+0, RAID 0+1, RAID 5

**Consider an array of N disks. Select the right order of the RAID levels in terms of effective data storage in descending order, i.e. for the higher to the lower data storage availability**

RAID 0, RAID 4, RAID 6

**Does an emulator read, interpret and execute all the bytes included in the memory of system it is going to reproduce?**

True

**Downtime is a period of time, or a percentage of a time span, when a system is unavailable or offline**

Regardless of the cause

**Each sector in a Hard Disk Drive is identified by three number**

Cylinder, Head and Sector

**Gmail is an example of**

Software as a Service

**In a three-layer network architecture of a Datacentre, which is the layer that is typically associated to the TOR switch?**

Access

**In memory virtualization**

Shadow pages are maintained by the VMM

**In memory virtualization, "ballooning" is a technique that**

Allows the VMM to ask guest VMs to release memory pages

**In the context of data centres, scalability is the ability for the infrastructure \_\_\_\_\_ without cost, efficiency, and reliability being compromised. Select the correct item to be included in the previous sentence**

to be enlarged or to handle an increment of the input requests

**In the context of SSDs, one of the following activities is NOT managed by the Flash Translation Layer**

Defragmentation

**In the context of SSDs, one of the following activities is managed by the Flash Translation Layer**

Address Translation

Garbage Collection

Data Allocation

**In the context of virtualization, "Microkernel" refers to**

A hypervisor running directly on the hardware, where device drivers are part of a service virtual machine

**In the Microkernel architecture of VMs**

Drivers are part of a specific service VM

**One of these configurations is not considered in Data-centre network architectures. Which one?**

Direct Connections

**One of these levels is NOT part of a typical three-layers network architecture of a datacentre**

Cloud

**The Application binary interface (ABI) is composed by**

User ISA and System Calls

**The following sentence: "The probability that the component does not fail in the interval 0 ... t, knowing that at the instant t = 0 the component was working correctly" defines**

Reliability

**The Nested Pages mechanism**

Is supported by the Translation Lookaside Buffer (TLB)

**The paravirtualization is**

A type of virtualization that requires a modified Guest O.S.

**The User ISA encompasses**

The aspects of the ISA that are visible to the application program

**To increase reliability, which of the following actions is not correct?**

Use elements with low MTTF

or "*Reduce MTTR to a minimum*" only if in the answers there is "Use elements with higher MTTF" (see exam 12 – Sept 2022)

**What are the benefits of data centre virtualization?**

Consolidation and ease of manageability

Cost savings in power and cooling of the data centre

Flexibility and agility.

**What is a computing infrastructure?**

Technological infrastructure that provides hardware and software for computation to other systems and services

**What is a Datacentre?**

A building or a portion of a building whose primary function is to house a computer room and its related support areas.

**What is a Graphical Processing Unit (GPU)?**

A specialized hardware meant to support data-parallel computation

**What is a hybrid computing system?**

A cloud composed by private and public cloud systems

**What is a Network Attached Storage (NAS)?**

A computer connected to a network that provides only file-based data storage services to other devices

**What is the average latency for a Hard Disk Drive?**

Time to wait for the sector

**What is the goal of the “machine-learning software as a service”?**

Provide ready-to-use machine learning applications

**What is the Hardware-level virtualization?**

The virtualization layer is placed between the hardware and the operating system

**What is the TBW in a Solid-State Disk?**

Total amount of data that can be written into an SSD before it is likely to fail

**When dependability-related requirements must be considered? Select the right answer**

In every phase of the design flow

**Which aspect is a drawback of data centre computing platform?**

Power consumption

**Which definition is encompassed by Dependability**

Maintainability: reparation to restore correct service

Reliability: continuity of correct service

Availability: readiness for correct service

**Which definition is not encompassed by Dependability**

Reversibility: ability to reverse a broken service, reversibility is not part of Dependability

**Which is the difference between Guest and Host?**

Guest: the software that runs in the VM environment; Host: the underlying platform supporting the environment/system

**Which is the main characteristic of the D-Cell topology for data centre network architectures?**

The network is organized in a recursive way

**Which is the most appropriate definition for "fault"?**

Any event interfering with the nominal behaviour of the system

**Which module is not typically present in the racks of a datacentre?**

Embedded systems

**Which of the following is not a feature of a fat tree topology in a data centre network architecture?**

It has a recursive organization

**Which of the following is a feature of a fat tree topology in a data centre network architecture?**

It has multiple connections to the core. It has a three-tier model

**Which of the following answer is not a typical component of a modern datacentre**

Solar panels

**Which of the following properties of virtualization allows to a virtual machine to be entirely stored in a file?**

Encapsulation

**Which of the following properties of virtualization allows to run multiple O.S. on the same physical machine**

Partitioning

**Which of the following properties of virtualization prevents users of a VM to access the memory of other VMs running on the same physical host**

Isolation

**Which of the following switches is first traversed by a request starting from a node of a data-centre and directed to the WAN, in a three-layers network architecture ?**

The first layer is the one directly connected to the physical machines, that is the access layer

**Which sentence about Tier Level 4 of datacentre is correct?**

All cooling equipment is independently dual-powered

Meets or exceeds all Tier 3 requirements

Fault-tolerant site infrastructure with availability of 99.995%

**Which sentence about Tier Level 4 of datacentre is not correct?**

Single non-redundant distribution path serving the IT equipment

**Which statement about Paravirtualization is correct?**

It cannot be used with traditional Operating Systems

**Which statement about Full -Virtualization is correct?**

Requires the hypervisor mediation

**Which statement about Platform as a Service is not correct? (the following are correct)**

PaaS supports the scalability

PaaS accelerates the deployment

PaaS provides developers with a programming-language-level environment and API

**With Bridged Networking**

Guests behave as physically connected to the network interface

## True/False

**A deep neural network cannot be trained on multiple Graphical Processing Units:**

False

**A system having very small reliability may have large availability:**

True

**A system virtual machine provides a complete system environment that can support an operating system (potentially with many user processes):**

True

**After a fault activation the system is always expected to fail:**

False

**All faults occurring in a system cause a failure of the system:**

False

**An Edge Computing system provide higher performance (in terms of memory and computation) than Internet-of-Things devices:**

True

**Blade servers are not the latest and the most advances type of servers in the market:**

False

**Blade servers provide load balancing and failover:**

True

**Blade servers require expensive configurations:**

True

**Data centres are buildings where multiple servers and communication units are co-located:**

True

**Data centres are well suited for real-time decisions in autonomous car context:**

False

**Graphical Processing Units within a tray are connected using high-bandwidth interconnects, such as NVlink:**

True

**Hybrid Clouds are systems where one or more public cloud services are combined with private data-centre resources into a single virtually managed environment:**

True

**In-rack cooling refers to cooling equipment where the cooling coils are adjacent to the rack:**

False

**In-row cooling adds an air-to-water heat exchanger at the back of a rack so the hot air exiting the servers immediately flows over coils cooled by water:**

False

**In-row cooling works like in-rack cooling except the cooling coils are not in the rack, but adjacent to the rack:**

True

**In a data centre for AI, servers includes both general purpose CPUs and accelerators (such as GPUs, TPUs and FPGAs):**

True

**In a data centre for AI, do servers comprise both general purpose CPUs and AI hardware accelerators (such as GPUs, TPUs and FPGAs)?**

True

**In a reliability block diagram, adding components in series decrease the system reliability with respect to the reliability of the single component:**

True

**In datacentre network, TOR refers to top-of-rack switches:**

True

**In datacentre storage context, DAS means Distributed Application Storage:**

False

**In the context of rack servers, 1U is 44.45cm:**

False

**In the context of SSDs, Pages are the smallest unit that can be read/written:**

True

**In warehouse-scale computers the software running on these systems executes on clusters of hundreds to thousands of individual servers:**

True

**Is the Java Runtime Environment an example of system virtual machine?**

False

**NVlink is a low-bandwidth connection among Graphical Processing Units:**

False



**Paravirtualization cannot be used with unmodified OS:**

True

**Paravirtualization is a particular type of kernel-level Virtualization that does not rely on a host OS:**

False

**Rack, blade and towers are form factor of servers in data centres:**

True

**Rack may contain batteries:**

True

**Rack servers need additional cooling systems due to their high overall component density:**

True

**Rack servers have a cable management that is more complex than Tower ones:**

False

**Rack shelves may contain switches:**

True

**Rack shelves are used to store servers and other IT equipment:**

True

**Rotational delay is the time needed by the disk to place the desired sector under the read head:**

True

**Seek delay is the time to move the read head to the desired track:**

True

**Servers in data centres are like regular personal computers with the same form factor:**

False

**The need for a constant Internet connection is one of the advantages of data centres:**

False

**The program in warehouse-scale computing is a service provided by internet:**

True

**The program in warehouse-scale computing may consist of ten or more individual programs:**

True

**The reliability of a Triple Modular Redundancy (TMR) system is always greater than the reliability of the single copy of the system:**

False

**The structure (or topology) of a reliability block diagram is always the same as the structure (or topology) of the modelled system:**

False

**Tower servers can be cooled easily**

True

**Tower servers consumes less space than rack and blade:**

False

**Tower servers have a cable management that is more complex than Rack ones:**

True

**Traditional data centres can host hardware and software for multiple organizational units or different companies:**

True

**Traditional data centres typically host a large number of relatively small- or medium-sized applications:**

True

**Warehouse-scale computers belong to a single organization, use a relatively homogeneous hardware and system software platform, and share a common systems management layer:**

True

**Warehouse-scale computers can be designed to operate on multiple data centres:**

True

**Warehouse-scale computers comprise important components related to power delivery, cooling, and building infrastructure:**

True

**Warehouse-scale computers run a large number of very small applications:**

False